REMARKS

ON THE TREATMENT OF

OBLIQUE FRACTURE OF THE CLAVICLE;

AND ESPECIALLY ON

The Application (with support of the adjoining Limb) of Pressure to the Lower Angle and Blade of the Scapula, as the Ruling Indication.

ALSO, THE SUGGESTION OF

NEW FORMS OF APPARATUS FOR THIS PURPOSE.

BY

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REVIEW OF THE TREATMENT

OF

OBLIQUE FRACTURE OF THE CLAVICLE,

INCLUDING

REMARKS ON THE APPLICATION, WITH SUPPORT OF THE ADJOINING LIMB, OF PRESSURE TO THE LOWER ANGLE OR BLADE OF THE SCAPULA, AS THE RULING INDICATION; ALSO THE SUGGESTION, FOR THIS PURPOSE, OF NEW FORMS OF APPARATUS.*

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Nothing in surgery is more notorious than the frequency with which the clavicle is fractured in the free portion of its shaft, and the difficulty inseparable from the treatment of these fractures; except, perhaps, the greater difficulty involved in the management of clavicular dislocations. The record of the embarrassment attendant on these injuries is not only as old as the history of therapeutic art, but presents, if we except the like history of oblique fracture of the thigh, the largest and most diversified array of combinations and expedients; and yet surprisingly little real advance is shown in practical results. All the numerous endeavors to secure

* This article was originally prepared, at short notice, in November, 1867, for the first volume of these Reports, but was unavoidably crowded out. Since then it has been somewhat recast and rewritten, but is substantially unchanged in other respects.

a genuine succedaneum appear to be based nearly on the same series of ideas, and to be followed by the same disheartening failure to attain the end desired; so that the very mention of a new attempt to solve a problem which seems so thoroughly exhausted, must be discouraging to the most determined surgical inquirer.

There is another view of this undoubtedly hackneyed question which renders us still less hopeful of interesting our readers. We refer to the equally notorious consolatory facts that, even among laborers, the amount of disability after fractured clavicle is generally slight, and that, except among the gentler sex, who are much less exposed to its occurrence, the deformity is of no material consequence. "Notwithstanding the truthfulness of this assertion," says Philippe Boyer, in his admirable commentary appended to the chapter on this subject in the unsurpassed work of his father (*Malad. Chirurg.*, 5th ed., vol. iii, p. 170), "it is not the less true that the honor of the art of surgery and that of the surgeon demand that all proper therapeutic means be put in practice, to obtain a callus exempt from deformity; and that more especially among women, who have their necks habitually uncovered, it is indispensable that the callus should be either not at all, or the least possibly, deformed." Legal reasons to a similar effect, no less than those involving the reputation of our art and science, afford a sufficient excuse for still continued effort. On all these motives of humanity and policy rests our apology for entering once again upon so threadbare a discussion. Commonplace as it may be thought to be, it has nevertheless attracted much attention in this Hospital, as one with which, apart from its intrinsic value, the theory and practice of the house have been rather prominently connected among American surgeons for many years past, in different publications, and more recently through the authoritative work of Hamilton. We propose to offer a brief review of the practice in our wards, and to submit some theoretical considerations which have been more or less current among the officers and students of the Hospital since 1861 or 1862.

Until within the last ten years, and during the previous half century, fractures of the middle third of the clavicle have usually been treated in the Pennsylvania Hospital, either with the bandage of Desault, or with some one of its numerous modifications, including rollers, handkerchiefs, adhesive strips, leather bands and buckles, and other like expedients. Among these latter, the standard and typical dressing, since its introduction in 1828, was the arrangement of Drs. Washington and Fox, so well known by the name of the latter gentleman, who was the first to employ and formally describe it. The sling, ring, and pad of this last-mentioned dressing were separately familiar to surgeons, even before the time of Desault and Boyer. Its merit, however, in the hands of Dr. Fox and his co-inventor, consisted in the particular combination of these three essentials, and in their methodical adaptation and employment under the principles of management, first clearly laid down by Desault, and advocated by his fellow master of surgery, in the Paris hospitals. The sling, ring, and pad were each carefully constructed and applied in such a manner as was thought, and found on careful experiment, to secure the best effect with the greatest simplicity and least discomfort to the patient. For this purpose, definite instructions were given as to the material and the size and shape of these different parts, and to the mode of using them in order to bring the displaced fragments into proper apposition. The difficulty in effecting or maintaining this coaptation, with the best arranged and fitting apparatus, has been, here as elsewhere, a constant source of trouble; so that the greatest success in the use of the bandage of Dr. Fox that could be reasonably hoped for, has been much more comparative than positive in all but a few exceptional and peculiarly favorable cases.

This combination of sling, ring, and pad, or some similar contrivance, more or less complex in character, seems, like the handkerchief devices of the European surgeons abroad, to have maintained its supremacy among practitioners of this country; although the number and variety of substitutes evince the universal experience, in respect to the

inherent defects of all such modes of mechanical treatment. The Pennsylvania Hospital apparatus has proved itself at least equal to any of them in its simplicity, and the consequent ease with which the various minor adaptations and adjustments could be made, and the readiness with which the necessity for these adjustments could be recognized by a competent practitioner. Still it certainly does require careful adaptation to individual peculiarities, and continual watching, and daily if not more frequent readjustment, in order to obtain even an average success. It differs little, however, in these requirements and shortcomings, from much other machinery which still holds its ground in mechanical surgery; and hence no clavicle appliance on the same principle would be likely to supplant it. Under the stimulus of recurring disappointment, and in despair of mechanical improvement, a simpler plan has therefore been revived, in this and other hospitals, and in private practice. This is the postural treatment, which has always been preferred by a few surgeons, and more or less resorted to by others, on both sides of the Atlantic.

We have already referred to the attention which has been paid in our wards to the shape, size and other qualities of the axillary pad, and of the construction and material of the sling and ring; also to the inelasticity, the direction and attachment of the tapes, in their influence on the shoulder through the elbow and forearm; and finally, to the well-balanced action of all of these together upon the individual patient. It is unnecessary to review the old discussions in relation to the working of the different forms and kinds of pad; whether advantageous in acting as a fulcrum, and in itself as an elevator and projector of the shoulder, or injuriously as a compressor of important nerves and vessels, and an irritator of the muscles and integuments; nor need we stop to consider other questions as to location of the pad, and the bearing and position of the arm and forearm. Although we have definite views upon these various particulars, it has not been the practice in the Pennsylvania Hospital to adhere to invariable forms and positions, but rather to adapt them to

the different indications; thus dealing with each case according to its characteristics. The object aimed at has not been so much to bring the elbow, or even the shoulder, into any one position as to reduce the fracture, and retain it so reduced; and hence, a decided requisite was to keep the seat of fracture at all times exposed to view.

The attitude of the shoulder, although necessarily involved in the reduction of the fracture, was held subordinate to the extension and coaptation of the outer fragment; and this extension was brought about by action on the shoulder, through pressure on the adjacent elbow, in such a manner as proved to be the most effective under the particular circumstances, in restoring the fragments to their proper apposition; that is to say, in removing, so far as could be, all traces of deformity, perceptible either by touch or sight. A closely-fitting sling was then so fastened over the elbow and forearm (by one diagonally stretched elbow tape behind, and two diagonally stretched wrist tapes in front), as to maintain the whole injured extremity as firmly as practicable and safe, with proper padding, in the position which the removal of the clavicular displacement showed to be the right one. In other words, the mode of putting on the dressing was strictly and simply practical, being governed by no fixed rule in its details and stages, except that of attending to the several indications arising from the nature and condition of the injury, and those of the different parts to be subjected to the different portions of the dressing. This practice would seem to be so self-evidently natural, that we would not have thought of dwelling on it here, if the precise direction of the arm, and various other matters of detail, had not been described by some writers as distinctive variations of the dressing.

The formation of the patient, on account of age, sex, habits, occupation, and other conditions, such as right or left side, and thinness or corpulency, must influence the relation of the shoulder, and the direction of the arm and forearm, and the consequent operation of the sling and its tapes, as well as of the pad. Notwithstanding all this atten-

tion to minute and various expedients, it was often thought advisable to modify the different parts with handkerchiefs and bandages, adhesive strips, and other aids; and of late years the tendency has been frequently to try other plans. To most if not all of them, including our own, the most valuable adjuvant has invariably been found to be position on the back, in bed.

This venerable mode of treating fractures of the clavicle had been a favorite with some of the former surgeons of the House, as it was and is at other hospitals in this country; its effect has been so uniformly and remarkably good, that the practice of enforcing the supine position upon all who would submit to it, has gradually acquired pre-eminence, until, as already intimated, it may be regarded as, for many years past, the ruling practice of the Hospital.

No form of apparatus has hitherto appeared to be so satisfactory in its operation on the fracture as this most ancient and simple of all the methods, when faithfully adhered to. But the unavoidable dependence on the good-will and discretion of the patient presents a serious obstacle, which is not seldom fatal to its success, as it was in the days of the father of surgery, whose lamentations thereupon have come down to us. So it ever has been, even in young girls and women, where the motive for submission to its irksomeness is of the strongest character.

In order to derive the full benefit from the recumbent posture, it would be necessary to bind down to the bed most children, by a bandage around the thorax; and equally indispensable to watch older persons incessantly, unless they were willing to incur the same rather formidable confinement of the body. The patient who desires to pass this ordeal of constant supination must be restricted to the position evenly and flatly on the back. The head should be slightly raised, so as to relax the sterno-cleido-mastoid muscles, and somewhat extend the trapezius. The arm and forearm of the injured side should be flexed and resting across the chest, with the hand reaching over the sound shoulder; or the arm should be extended at a right angle from the chest, and allowed to

rest, with the forearm at ease upon the mattress, or a pillow thin enough to keep the back of the elbow slightly lower than the surface on which the body rests.

The first of these two different positions will be recognized as the one recommended by Velpeau in the treatment with his bandage. It is one originally described by Hippocrates as common in his time, either with a handkerchief-sling, or in connection with confinement on the back (Littré's ed., vol. iv, p. 131). Although sometimes deceptive, it is probably the best in most cases, especially when maintained with the bandage or a handkerchief properly applied. It is rendered more efficient by the addition of a long and moderately broad and firmly stuffed pad, so placed as to press upon the lower part and angle of each scapula in such a manner as we shall presently explain. The second position is that of Dupuytren, described, not very clearly, in vol. i, last edition, of his Leçons Orales; and in the Sydenham translation (vol. for 1847) by Mr. F. Le Gros Clark (p. 97). We have found it to work even better than the older one in its effect upon the fragments, and about as well in its comfort to the patient, the only disadvantage being the greater difficulty in keeping the parts at rest. For the purpose of securing this needful quiet, an angular splint might easily be arranged to maintain the limb *in situ*. A mode of extension by weight or by elastic bands might be added also, which would leave nothing to desire but a less tedious confinement.

In studying the rationale of the supine posture treatment of fractured clavicle, we, years ago, became satisfied that the better apposition of the fragments and the accompanying return of the shoulder more nearly to its natural status upwards, backwards, and, possibly, outwards, might be due somewhat to the prevention of the downward gravitation, by the removal of the weight of the affected limb, and perhaps a very little also to the changed action of the weight of the shoulder in gravitating backwards; but that the main and chief cause of action in all these directions was in the pressure of the weight of the chest and body upon the lower

third or two-fifths of the scapula, or the half of its lower blade, including the whole of the projecting inferior angle of that bone.

This pressure, when properly applied, as we have long since repeatedly demonstrated in fracture cases in patients of different ages at the Pennsylvania Hospital, may be seen at once to push the whole of the blade-bone upwards and outwards, carrying, of course, the top of the shoulder with the clavicular fragment to which it is articulated; at the same time that the lower angle of the scapula is driven forwards on the thorax and rocked on its transverse axis over the ribs in such a manner as to throw the acromial or shoulder end in the opposite direction, or backwards, no less than upwards and outwards. The same pressure may still further operate, perhaps, by checking the contraction of the upper and middle bands of the serratus magnus, which might possibly have some effect, along with the rhomboidei and levator anguli in distorting the scapula and otherwise depressing and shortening the shoulder.

Dr. J. H. Packard, who discusses this subject to some extent in a lecture before the College of Physicians of Philadelphia, in 1866, and published in the New York Journal of Medicine in the following year (p. 93), is disposed to attribute much of the displacement in oblique fracture of the clavicle, to the action of the serratus magnus alone, in combination with the pectoralis minor, although these muscles are really more apt to antagonize each other. The only portions of the serratus which can produce this effect are those which draw upon the upper posterior angle and margin of the bone, and they are less injurious in the direction of the distorting force than the rhomboids and the levator anguli. Whatever muscles are affected, the influence on the position of the bone is evident enough. The movement of the shoulder backwards is, for obvious reasons, more decidedly produced than the other two restorations, and notably than the outward. Both of these, and especially the outward and most difficult movement, may be effected by resorting to one of the two positions of the adjacent extremity, already de-

scribed as the respective adjuvants of Hippocrates and Dupuytren. The employment, also, of weight extension of the arm outwards, and slightly upwards and backwards, by means of adhesive strips, and a pulley at the bedside, or, if preferred, through the agency of an angular splint with elastic bands and a counter-extending arrangement, would complete a system of operation which promises more mechanical aid than we can discover in any other method hitherto devised. Thus we may have all the old-established requirements at least as well fulfilled; while the most difficult and hopeless of them, which opposes the shortening due to the falling inwards, is better provided for than any other plan, in bed or out of it, has yet secured.

The old idea, so far as it appears to have been definitely expressed by Hippocrates and his followers, and the one which has generally been accepted by modern writers, was that there should be a pillow or compress "*between*" the shoulders, so that these parts might fall back on each side of it; or that they might be drawn towards each other by bands or belts pressing in front of them and crossing between them behind. Many forms of apparatus, like the cross of Heister, the folded towel of J. L. Petit, the corset of Brasdor, and others, including all the ordinary figure-of-eight arrangements, were based on this view. Impracticable and inefficient as they were, they yet made an approach to what was wanted, while they indicate a practical sense of the need of operating rather on the spinal margin of the scapula than solely on its upper angle. Theoretically, however, these surgeons looked to the centre of the back as the *point d'appui*, and to no other portion except the shoulder, either in its front where the outer fragment was exposed to their manipulations, or indirectly, in its glenoid cavity and articular attachments, through the arm; in which the command of power was insufficient and uncertain, and too apt to prove detrimental to important soft parts if efficiently exerted. Some of them, surgeons as well as anatomists, nevertheless do call attention to the displacement of the scapula, and especially its projecting angle, and even go so far as to

allude to the necessity of fixing this bone in order to act upon the fractured clavicle. Among comparatively recent writers, we may quote, as the most complete and pointed in its brevity, that we have discovered, in a careful search, except, perhaps, some phrases from old Turner, one of whose paragraphs is quoted by Frank Hamilton (p. 189), a passage from the work of Mr. Hind (Illustrations of Fractures, 1831, p. 2). He says: "The scapula itself is turned upon its axis, the glenoid cavity being depressed, from the causes enumerated above [weight of the extremity and contraction of the subclavius muscle], so that the base, instead of being nearly parallel with the spine, now takes a new direction, viz., the inferior angle is approximated to the spine, and is held there by the rhomboideus major, while the superior angle is pulled from the spine by the weight of the arm, and raised by the trapezius, levator scapulæ, and rhomboidei muscles." "Upon the basis of the foregoing facts," his treatment "consists, in the first place, in bringing the acromial extremity outward and on the same line with the fractured extremity of the inner portion; and, secondly, in *raising the scapula* and outer portion of the clavicle to its original level with the sternal or fixed portion." Notwithstanding this direct and clear, although extremely brief, description and precept, he has nothing better to suggest than "Boyer's bandage for fractured clavicle, or the handkerchief for the same." Turner (Art of Surgery, vol. ii, pp. 259, 260) speaks of the office of the clavicle "being principally to keep the head of the scapula or shoulder, to which, at one end, it is articulate, from approaching too near or falling in upon the sternum." But he does not invite our attention to the displacement of the different portions of the blade-bone, or advise us to attack it; except that he directs the "thrusting out of the scapula" (*ibid.*, p. 260).

Dr. Reynell Coates, in an excellent article On the Use of Desault's Bandage (Am. Jour. Med. Sci. for 1836, p. 65), gives an elaborate and able exposition of his view of the various changes in the position of the scapula. He speaks of the rotatory movement of this bone accompanying the

descent of its acromial end as "very much restricted," but sufficient to produce "some slight approximation to the spine, and some little undue prominence of the inferior angle of the scapula." He tells us that the "rhomboidei muscles aid in this placement." He considers that the levator anguli, rhomboid, and trapezius muscles antagonize the serratus magnus, so that the "muscular stasis of the base of the scapula" is "not perceptibly influenced by either of these sets of muscles." Without further quotation as to particular muscles, we desire to cite his concluding paragraph: "While the shoulder is descending, and the scapula rotating, as has been represented, the force of the whole muscular apparatus which draws the arm towards the side of the thorax is resisted behind by the powers which preserve the stasis of the base of the scapula, which part becomes an axis of motion; and the natural counteraction of the clavicle being lost, in consequence of the fracture and the primary displacement, the apparatus in question causes the shoulder to approach the sternum in the only possible direction by causing it to revolve forward round the axis just mentioned."

We have already alluded to Dr. J. A. Packard as having recently called more particular attention to the scapula as the leading bone displaced and requiring to be reinstated in the treatment of fractured clavicle. He is the first and only writer, so far as we are aware, with the exception of Dr. Wales, in his "Mechanical Therapeutics," who refers to Dr. Hartshorne and quotes Dr. Packard, who has made any nearer approach, than what is quoted above from Hind and Coates, and which might be found in many other works, to what we regard, and for at least six years past have repeatedly explained and demonstrated at the Pennsylvania Hospital, as the proper view. Dr. Packard gives an extended argument in support of his idea of the action of the serratus magnus, in which he differs from others in overrating the injurious action of that muscle. He appears to us to have erred, also, in attributing the restorative effect of the supine position to "pressure on the inner margin of the scapula," instead of the inferior angle or lower third or

two-fifths of the bone. Like Mr. Hind, and, we may add, Dr. Coates, he makes less progress in his practice than he does in his theory, by recommending us to carry "the scapula backwards" by "acting on the head of the humerus, either by a figure-of-eight bandage, properly applied and bearing on the sound shoulder, the elbows being carried forwards and well supported, or by a cap of muslin or linen so made as to embrace the upper part of the arm, and fastened in the same way." He then recommends the folded sheet arrangement of Dr. J. C. Palmer (Am. Jour. Med. Sci., 1863), which is an ingenious modification and improvement of an extemporaneous figure-of-eight bandage, "as a very comfortable contrivance for this purpose" (*op. citat.*, p. 105).

The contrivance which seems to approach, among the forms of dressing recommended, the nearest to a true scapula restorer and supporter, so far as a very considerable inquiry through all the leading authorities, from Hippocrates down to the present day, has enabled us to ascertain, is something like the apparatus of Brefield. This is recommended by Chelius "before all others," of which he specifies a large number, "on account of its simplicity, its easier application, and the little inconvenience it causes" (System of Surgery, South's Trans., Am. ed., vol. i, p. 605). He describes it as one "in which both shoulders are brought together towards a board provided with a thick covering, placed upon the back, and to which they can be drawn back by padded straps." This padded board with arm-hole straps savors a good deal of the figures-of-eight, and Heister's cross; and yet it is not difficult to imagine how very little alteration of the back-splint and its accessories might produce a very useful substitute for the scapular pad or pillow in the recumbent posture.

Many first-rate authorities are mentioned as preferring some form of back-splint; but neither Chelius nor any of them seems disposed so to look upon the relationship between the scapula and clavicle in practice, as to think of the scapula as the bone which these back-splints ought to press upon, in order to be of any use, except to hold the

shoulder-loops. In one place he does speak of the "blade bone," that it "projects strongly, and the collar-bone is materially curved," when the broken ends of this latter bone "unite at an acute angle." The importance of acting on this "projecting" blade-bone, in order to secure the requisite control of the acute angle at the seat of injury before the mischief is established, or at least to lessen the considerable deformity, does not seem to occur to him. We have no doubt that Chelius, like all other great teachers of surgery, from the sage of Cos himself, had some notion of what was to be done to the scapula, when attempting to show his pupils how to work upon a fractured clavicle, through a shoulder of which the acromial articulation was the important part; but he and they have hardly given us more than a feeble sign of the precept; certainly not the precept itself, in any clearly practical form. Our text-books and clinical demonstrators do not explain the principle of fixing the scapula in order to fix the shoulder, in such a way as to make it clear to students, that the shoulder can be fixed at all. The idea, as generally conveyed, is too vague and confused because incomplete; and is consequently too often misapprehended, or entirely disregarded. It is on this account, more than because of the rebellious nature of an injury, which rarely involves a question of malpraxis, and is comparatively unimportant, except to women, that we desire to attract attention to the subject.

The brilliant teaching of Desault, together with his high authority, and the adoption and development of Desault's leading thought by the equally distinguished Boyer, seem to have established the system of acting on the shoulder as the summit of the arm, rather than as the acromial corner of the scapula; and of striving, at a disadvantage, to move the shoulder only through the loose extremity suspended from it; instead of remembering the great broad triangular bone which makes the shoulder, and, through its muscular connections, produces nearly all the displacement in broken clavicle, except what may be due to the action of the subclavius muscle and of the dependent arm and forearm.

The observation of a large number of cases, together with much careful reflection and inquiry, since our attention was more closely drawn to the subject years ago, by the inevitable embarrassment attendant on the majority of these cases, have only served to increase our conviction, that the scapula *as a whole*, and not the shoulder alone, should be the object of attention to be dealt with, in the treatment of fractured clavicle. *The pressure is to be made directly upon the lower blade of the scapula about and just above its angle, behind the chest, not through the humeral articulation by the arm and elbow.* If attempted above at all, the pressure should be applied directly in front of the acromion; not indirectly through the glenoid process and capsule underneath it, and not upon the acromial fragment, care being taken to avoid pressing the acromion downwards or inwards, in trying to push it backwards. The pad should be discarded from the axilla as doing more harm than good, and failing to maintain extension, in the great majority of cases, no matter how constructed or employed between the humerus and ribs; but a broad and long wedge-shaped pad might be rendered useful as a compress, on the lower blade of the scapula. Finally, we have become convinced that confinement on the back in bed has thus far proved the most satisfactory mode of securing the desired result; this position on the back being, doubtless, further useful in pressing on the muscles of the neck and back, which are connected with the scapula.

On these points there seems to be no material difference of opinion among the attending surgeons of this Hospital. The conclusions may be fairly stated, therefore, as comprehending in general terms, both the precept and practice of the Hospital for some years past, although the apparatus of Dr. Fox, and other bandages, are still resorted to from time to time upon exceptional cases.

The one redeeming feature of the treatment on the back is, that this tiresome confinement need rarely be insisted on, in full rigor, during a longer period than from ten to fourteen or fifteen days in grown persons, and eight or ten in children; since the rapid progress of reunion in fractured clavicle

generally produces a considerable amount of firmness in the great majority of cases by the end of the second week. This early union is a well-known source of trouble in the management of neglected or unrecognized fractures, such as are frequently presented. We have repeatedly met with injuries of this kind, in which the firmness had become so great in the course of ten or twelve days, that no satisfactory impression could be made upon the deformity existing.

Hamilton, who quotes many as having habitually employed the postural treatment, gives the recommendation of several of these, and refers also to his own experience. He tells us that "Hippocrates, Celsus, Dupuytren, Flaubert, Lizars, Pelletan, and others, directed the patients to lie upon their backs, with little or no apparatus, but generally with the spinal column so supported and lifted with pillows, as that the shoulders would, by their own weight, fall backwards. S. Cooper and Dorsey also recommend that the patient shall be confined in this position during most of the treatment; and from the accounts given by Dr. Lente, it will be understood that a similar plan is generally adopted in the New York City Hospital." 'But this result (deformity) rarely happens when the patient has strictly followed the directions of the surgeon as to position especially, for it is by position more than by any other remedial means, that a good result is to be effected. . . . . The persevering continuance of the supine position in bed, with the head low, and, if necessary, a pad between the shoulders. This is the treatment uniformly adopted by Dr. Buck in the Hospital, and the results of his treatment are certainly such as to recommend it highly.' "Nearly the same method," continues Hamilton, "we find recommended by Dr. Alfred Post in 1840, then one of the surgeons of that hospital; the arm being merely kept in a sling, and bound to the side, with the patient lying upon his back." (Fractures and Dislocations, pp. 192, 193.)

We doubt whether an accurate idea, or, at least, a safe one to follow, is here given of the practice of these distinguished surgeons, although it is certainly a common one, and is spe-

cifically stated by many writers. If the pillow or pad be broad enough to cover both scapulæ, or be confined in its application to the injured scapula alone, there may be no objection to it; but an interscapulary pad or pillow, which should so support the spine that the shoulders might fall backwards, would be more apt to increase the deformity by forcing the scapulæ apart, and thus making pressure in the wrong direction. We have no idea that this pressure was allowed to be so applied in the cases here referred to, but such a practice might very naturally be adopted from the description given.

The best kind of a pillow is an unyielding one, which is broad and long enough to cover the whole back of the chest, and inclines slightly from above downward, allowing a somewhat greater elevation for the head and shoulders than for the loins or waist, the depth of the upper margin not being greater than eight or ten inches, and that of the lower two or three; very much such a wedge-shaped bolster as we find accompanying the best made mattresses of the present day.

A compress of this kind, if firm enough, and furnished with an extra elevation adapted to the injured side, might be made to answer the purpose of a permanent dressing like a back-splint, which it really is, by being fastened with a roller bandage around the body and both arms, confining them, and thus fixing both extremities and the whole thorax. A well-padded back-splint, long enough to reach across the chest, and wide enough to reach from the armpits to below the angles of the scapulæ, would answer better than a pillow, and could be made to act upon the shoulders by means of padded upights running up at each end, in such a manner as to pass through the axillæ to press upon each shoulder in front of its acromion. These uprights might be of iron, steel, or hickory hoop material (corset-bone for instance), and so bent and applied to the fronts of the shoulders as to press upwards and backwards to an excellent purpose; leaving nothing to be desired but a weight extension outward of the arm, or an elastic band connection of the latter with the bedstead, or

an extending and counter-extending angular splint, in case such extension should seem desirable in any particular case.

It would then only remain to put the head in durance, as suggested by M. Guèrin, of Vannes (Archives Gén., 1845, p. 33), to prevent the action of the sterno-cleido-mastoids, and the mummy fixture would be complete. However repulsive this may appear in the description, it would do less harm, and could not subject the patient to greater discomfort, than many other dressings for the same purpose have repeatedly inflicted. There is no need, in ordinary cases, however, for any disagreeable constraint, since the desired effect can be produced without confinement of the head, and with very little other wrapping. In short, the unaided supine position, as previously explained, will answer wonderfully well, if faithfully observed; it sometimes does admirably, even with a lax attention to what are regarded as essentials. Nor is there any material objection to a perfectly level surface, with a small pillow under the head and neck. Slight elevation of the head, besides increasing comfort and lessening cerebral plethora, relaxes the sterno-cleido-mastoids, and lessens the liability to disturbance of the inner fragment; at the same time that the trapezius and other muscles are not injuriously drawn upon, as the trapezius would be more likely to elevate than depress or adduct the acromion if its fibres were extended. We may, therefore, hope for excellent results from this simplest and easiest form of postural treatment, notwithstanding those ever-active sources of anxiety, in the irksomeness of the confinement, and the constant inadvertence of the patient.

In illustration we may refer to the case of a young lady, now twenty years old, in whom we succeeded, nine years ago, in fully carrying out the simply recumbent plan of treatment for an oblique fracture of the middle third of her left clavicle, the only exception being that a sling was employed to support the arm and to satisfy the meddling friends. She was then an intelligent girl of eleven years, who recognized the importance of the position, and was fortunate in having a sensible and faithful mother whom she was anxious to obey.

There was a well-marked deformity, with considerable dropping and shrinking inwards of the shoulder, probably increased by the violence of the fall upon that part, which caused the injury. This deformity disappeared entirely, as soon as she was placed upon a hard spring-seat sofa, in the supine position; and mother and child together persevered so thoroughly in following my directions, night and day, during two whole weeks, that the restoration seemed to be a perfect one. No shortening or other trace of injury can be detected at the present time, both mother and daughter being positive in their opinion that there is none to be found. The rapid union in fracture of the clavicle, which affords, as we have already remarked, a great advantage in this method of treating it, was advantageous in this instance; since decided stiffening occurred within the first ten days, and sufficiently permanent consolidation was established in about fifteen days to render a sling or handkerchief an ample support.

We can recall at this time but two, out of many such cases, treated on the back in the Pennsylvania Hospital, in which the position was invariably and uninterruptedly adhered to throughout the two weeks' course by the patient; so difficult is it, even in a well-regulated public hospital, to enforce the needful absolute confinement. One of these patients was an intelligent man of great endurance and determination, who took an unusual interest in the experiment. The other was confined to his back by bad compound fractures in other limbs. Both cases were marked by unusually good recovery. This latter case of complication with more serious injuries is so common an occurrence, that it is often mentioned. We doubt not that others equally remarkable might be found upon our records. Admitting, however, the frequently insurmountable difficulty in following up this treatment by position alone, our impression is, at all events, that as we have, in the pressure on the lower scapular angle and the confinement of that bone, the guiding principle of management, an apparatus may be made to act, in accordance with this principle, if not as well as position on the back, at least much better than any of the bandages,

yokes, and splints with which we have been hitherto familiar. Nor should we be greatly surprised or disappointed at hearing, sooner or later, of more than one such instrument already tested and established, under the guidance of the ever-active ingenuity and self-reliant and practical good sense of the members of our profession in this country. The principle, if as just as we believe it to be, may have been well understood and intelligently acted on in other places, as it has been here.

When the resistance to extension is moderate, as in children and persons of slender frame, a correspondingly gentle pressure on the lower corner or blade of the scapula will suffice to rock and carry its opposite acromial end or summit into its normal position, and with it the outer fragment of the broken bone to which this acromion is attached. When the muscular and osseous developments are greater, and when the amount of fat is considerable, the *modus operandi* of position is not so readily exhibited. The effect is sufficiently striking, however, even in these cases; especially when a pad is resorted to, and the arm is confined upon the chest in front with the hand upon the shoulder. We have seen the parts admirably sustained, in this position of the extremity, by the bandage of Velpeau, with the pyramidal pad securely fixed over the lower angle and two-fifths of the scapula behind. More recently we have preferred the position of Dupuytren, in which the arm is laid at right angles to the body, with the forearm comfortably flexed and the pad confined with adhesive strips.

There were, at the original date of this paper last year, three cases of oblique fracture of the middle third of the left clavicle recently admitted into the Hospital. In two of these cases the injury was the result of direct violence, and in the third it was caused by a fall upon the shoulder while the man was carrying on his back a heavy bag of salt. This third man was stout without being decidedly fleshy. He was not round-shouldered, and his chest was well developed. The displacement was very decided while he sat upright in bed, but nearly disappeared when he resumed

his position squarely on his back. Even the shortening was materially overcome when the forearm was flexed, the elbow was brought forward on the chest, and the chest itself was placed evenly upon the well-stuffed mattress, with the shoulders square and the trunk in proper line. This rigorous confinement was frequently reimpressed upon the patient; but it was so constantly disregarded and escaped from, that it could not be relied upon in his case except as a less illusory substitute for the ordinary bandages.

The other two men were much more slender in frame and flesh; and hence it was easier to make and to show the desired impression on their scapulæ. One of them, unfortunately, was affected with mania-a-potu, and soon became an impracticable subject. Although at first he was confined to bed with a wedge-shaped pad under the angle of the scapula behind, his arm being flexed and resting with the elbow in front and the hand on the sound shoulder, it was soon necessary to apply the Velpeau bandage, with the pad still pressing on the angle of the scapula, and to remove him to a separate room. He subsequently recovered with very little perceptible deformity — under the circumstances an excellent cure. The second patient happened, when first seen, to be enveloped in a modified Desault's bandage, which aggravated the deformity, and materially interfered with the action of position on the back, by pressing the acromion forwards, inwards, and downwards. This consequently increased the displacement of the fragments, and maintained the lower angle of the scapula entirely out of place in the opposite direction, notwithstanding the pressure of the weight of the body upon this projecting part. In this case the application of pressure with our fingers on the angle of the scapula partially counteracted the effect of the bandage, and lessened the deformity. Still firmer pressure thus applied, by the hand of an assistant, to the scapular angle *behind*, at the same time with additional and *counter*-pressure applied, through his other hand, to the acromion angle *in front*, almost completely reduced the fracture. We thus drew upon the depressed and underlap-

ping fragment of clavicle by lifting up its adjacent scapula, and by working, as upon an ordinary lever, on the diagonally opposite corners of this latter bone, and in the direction of its greatest length.

The artificial or extraneous interference with the usual effect of postural treatment, caused by a constricting bandage, was in this instance apparently greater than that of the natural forces. The unusually light weight of the slender patient's body may have increased the difficulty, unless that were compensated for by the slighter displacing power of the depressing and adducting muscles of the arm and shoulder. At all events, the case furnishes a useful illustration of the bad policy of an attempt to combine two modes of treatment, which are incompatible with each other, unless very particular care is exercised in meeting indications; at the same time that it reminds us of a danger of making matters worse instead of better, that is often present in the application of a confining bandage for a fractured clavicle.

It is not our purpose to enter into a detailed consideration of the action, already incidentally alluded to, of the various muscles in distorting the scapula, and drawing the shoulder inwards, forwards and downwards; although we have examined every accessible authority upon the subject, in addition to long-continued and often-repeated study in actual experience. We have found little material disagreement among these authorities, except that some are more inclined to look upon, or at least to mention, a larger number of muscles as at fault than others. We are disposed to agree with the former class as sustained both by reason and observation. There is good reason for believing that all the true motors of the shoulder, including the latissimus dorsi, sometimes, and all the elevators and depressors of the clavicle and scapula, are more or less directly or indirectly concerned in disturbing the normal relations of the two ends of a clavicle whenever this has lost its continuity by fracture; provided the fracture is oblique, or the fragments are completely separated from each other, and not retained in place by ligaments, as at the outer and inner thirds.

The investigations of the comparative anatomists upon the different forms of structure as illustrating functions and relations—the comparative physiology and the homology—of the different portions of the shoulder girdle or scapular arch—the scapula, clavicle, sternum and their homologues, in different animals, are full of interest. Whether it be regarded as a portion of a vertebro-costal system or as an independent arrangement, which constitutes so wonderful a source of varied power, the study of this arch or girdle ought to be at least as useful to the surgeon and pathologist as it can be to the naturalist.

At all events, the mechanism of this portion of the frame, which is regarded by Cruveilhier as the "analogue," and by Owen as the "homotype," of the more solid and differently functioned pelvis, requires consideration. Combining the duties of protection and support, with provision for mobility in nearly all directions, without sacrifice of force or form, or increase of weight, the two shoulders together constitute a jointed and elastic bony collar, of which the hard and soft parts are so distributed as to provide outworks to the chest, centres of motion to the ribs, spine, and arms, and nearly universal joints to the upper limbs. Looking upon the two symmetrical halves of this rim of the trunk as constructed of their bony wings behind and spring-like arches in front, we find two great flattened cup-like sockets gliding up and down, backwards and forwards, inwards and outwards, in more or less limited arcs of circles. To the summits of these the upper limbs of the body are loosely attached in such manner as to hang conveniently by the side, and yet to allow of great latitude of motion, and thus to complete the universal joints. In this admirable arrangement each half of the girdle depends for its connection with the trunk, and its only *point d'appui*, upon the sterno-costal articulation of the inner end of the clavicle. This bone, girder-like and doubly curved and twisted, in the short transit across its half of the pectoral space, forms, with its corresponding fellow, through the intervening sternum and interarticular cartilage, and the subjacent first ribs, a sort

of toggle-joint adjustment, which affords a firm, although partially movable, basis in front, for the wider movements of the incomplete remainder of the collar behind. For the posterior mechanism we have the broad and flat, triangular, wing-like, three-bladed scapula, somewhat more loosely attached, by its projecting acromion above, to the outer end of the clavicle; gaping open by its spinal margin at some distance from the mesial line, spreading closely over the upper back surface of the chest, and reaching downwards by an elongated angle to obtain the leverage required for its connecting muscles. Under the "archetype" view, the shoulder girdle is a development of the vertebral axis, like the head, ribs, and pelvis. According to Oken, Carus, and others, its bones are vertebral, the limbs being "liberated ribs." Maclise (Cycl. Anat. & Ph., Skeleton, p. 672), shows that clavicles "refer to the ribs," and scapulæ "to the vertebræ." Another idea is that of Owen, as explained in his different works. He regards the upper and lower limbs as "diverging appendages" to the vertebral column, through the scapular and pelvic arches, these being, both, rib-like, and differing from each other only as they differ in their functions. Wyman (Symmetry and Homology in Limbs, Proc. Bost. Nat. Hist. Soc., 1867), regards the scapula and ilium, clavicle and ischium, coracoid and pubis, as homologous, and the limbs as tegumentary organs secondarily uniting with them.

Whichever the aspect, the collar-bone in man is the only one by which his shoulder is united to the trunk, and its muscular relations are protected from disorder. The indispensable duty which the clavicle performs, as the stay of the shoulder, has always been appreciated. Every one is familiar with it as the medium of union between the upper limb and the body, and hence the transmitter and supporter of motive power, and as a basis of attachment for important muscles. Holden sums up the story thus,—"Its chief use is to keep the shoulders apart, that the arms may enjoy a freer and wider range of motion. By moving the shoulder you will find that the clavicle acts as a prop, the fixed end of the

prop being at the sternal joint." "All animals," he reminds us, "that use their fore limbs for other purposes besides support,—such as climbing, flying, burrowing, or holding objects,—have clavicles. Those that use them for support only, have no clavicles." (Human Osteology, pp. 109, 110.) Another author states it still more shortly by saying that a man with broken clavicles is reduced to the condition of "a non-claviculated animal." All this is strikingly illustrated by the remark of Cruveilhier, that he had often recognized left-handed persons by the greater development of the corresponding sterno-clavicular joint, and could readily distinguish the laborer of either sex by the prominence of both joints, as well as by the greater size of the bones.

The practical application of these relations, however, as capable of demonstration without special display of anatomical or physiological knowledge, is of paramount interest to us in this place. Indeed, the demonstration of the effect of pressure on the projecting lower portion or long blade of the scapula is so easily made upon a recent subject of the fracture, and the effect of position on the back has so often attracted the attention of observers, and seems to be so very easily accounted for, that it must have always been resorted to by practical men; since the relief afforded, in the first few days after injury, by lying down upon the back, was certainly discovered at a very early period. The wonder therefore is that the projection of the scapular angle, which it so manifestly does away with, has not been far more frequently pointed out and dwelt upon as affording the leading practical suggestion as to treatment. Mr. Humphrey, in his classical work on the Human Skeleton, remarks that the difficulty experienced "in maintaining a correct apposition of the broken ends, during their reunion, depends very much upon the small diameter of the shaft and the weight of the upper extremity hanging upon it" (p. 362). This is the strongest reason why we should endeavor to maintain the proper amount and kind of that extension upon the fragments, which, in the right direction, is the surest method of coapting the separated fragments of

any long bone, however small in its diameter, and however that extension may be brought about.

In speaking of the "prolongation" of the inferior angle of the scapula, in compensation for the projection of the acromion, after reviewing the action of the muscles depending on the strong and prominent spine, of which the acromion is the well-marked termination, and explaining how, by the prolongation of the scapula downwards at its inferior angle, a leverage is afforded, whose office it is to maintain the position of the blade of this bone, which more than counterbalances the leverage afforded by the acromion to the deltoid, in enabling this muscle and others passing from the scapula over the shoulder, to produce their required effect upon the humerus, Mr. Humphrey goes on to say (p. 365), "The importance to the movements of the arm of such provision for the efficient action of these muscles, is well illustrated by cases in which the latter are weak or paralyzed, or inactive from some cause, or in which the angle of the scapula has slipped from beneath the edge of the latissimus dorsi. In such cases, the contraction of the deltoid, instead of causing the head of the humerus to rotate in the glenoid cavity, causes the glenoid cavity to roll upon the humerus, and pulls the lower angle of the scapula backwards and upwards, so that it projects beside the spine. The patient may be thus rendered quite unable to raise the arm, each attempt to do so being followed by the revolution of the scapula, instead of by the elevation of the elbow. Thus the vertical elongation of the scapula in man, in comparison with its depth from before backwards, has relation, not only to the small antero-posterior diameter of his thorax, and the sharp curvature of his ribs, but also, and more particularly, to the freedom and power of the movements of his arm. It may be remarked that the angle at which the humerus is set upon the shoulder-blade, though favorable to the general range of the movement at the shoulder, is particularly unfavorable to the muscles which raise the arm. The acromion is therefore thrown out to afford some compensation in the way of leverage to the great muscle which has the principal part of that

duty to perform; this necessitates more secure provision for fixing the scapula, so as to render it a firm *point d'appui;* accordingly, the growth of the inferior angle in one direction has relation, and is in general proportionate to the growth of the superior angle, the spine, and the acromion, in the opposite direction."

After this lucid exposition of the importance of the inferior angle of the scapula, in counterbalancing the excessive projection of the acromion, we need hardly occupy any space in further trying to show what amount of leverage is required to counteract the much greater disorder in the action which occurs from the loss of the regulation and support which this upper angle must derive from its clavicular key.

Since citing the foregoing passages, we have obtained a copy of the "Outlines of Human Osteology," so highly praised by Prof. Humphrey in the work just cited, by Todd and Bowman, also; and by Mr. Callender in his prize essay on "Fractures and Dislocations of the Clavicle and Shoulder." His remarks upon various points, and especially his description of the "shoulder in general," are so interesting, that we do not hesitate to quote the whole of the principal paragraph. We gladly refer, also, to the descriptions of the scapula and clavicle, as among the most striking and instructive that we have met with. His accounts of the head of the scapula, and of the various angles and blades or "plates" of this bone — of the "essential elements of the scapula" — and of their relations to each other, as illustrated by his diagrams; and his explanation of the manner in which the muscles of the scapular fossæ act in drawing the head of the humerus towards the scapula, and maintain it in close contact with the glenoid cavity, are all especially worthy of note, but too long for insertion here. In describing the "three plates" which spring "from the angles of the prismatic axis," "one forming the spine, the other two constituting the supra and infra-spinous portions of the ala," he remarks, that "in the human scapula the lower plate is four times as large as either of the two upper, which are about equal in extent, and support each a process" (p. 232).

"The shoulder," says he (p. 240), "formed of the two bones that have now been described, is a movable fulcrum, which supports the humerus in its position at the side of the thorax, and at the same time allows it great latitude of motion. For this purpose it presents a horizontal branch in front, a vertical one behind. The horizontal branch, *the clavicle*, resting against the sternum, prevents the humerus from falling inward. Curved and highly elastic, it has the power of sustaining, without fracture, concussions of considerable violence in the direction of its length; the arch and prismatic form of its body enables it to resist blows coming from the front; while the peculiar form of its sternal articular surface, which is alternately convex and concave, and fitted with an elastic, movable fibro-cartilage, gives it considerable freedom of motion both in the horizontal and vertical plane. The posterior vertical lever, the *scapula*, being confined by no other articulation than that between the acromion process and the clavicle, of course enjoys the utmost possible variety and extent of motion; and, at the same time, the constant apposition of its large anterior surface to the surface of the thorax (on which it glides freely by the interposition of flat muscles), keeps it firm and steady in every position that it assumes; while the costa, and processes, which run, in every direction, from the neighborhood of the glenoid cavity, afford powerful leverage to the muscles by which it is moved."

We have long thought it passing strange that the artificially mounted or wired skeleton of the schools, should be so badly treated in the unnaturally close, stiff, and ill-placed connection between the scapula, by its lower angle, and the thoracic ribs, which is the usual mode of attaching that portion of the framework to the outer surface of the chest. The miserable, shrunken, narrow-chested and round-shouldered figure thus produced, does not only give a wretchedly erroneous idea of the human form divine, by inflicting on it the very stamp of meanness so nobly avoided in the flesh. It still more injuriously confounds the otherwise easy comprehension of the really noble functions and operation of

the bony shoulder-socket, and effectually prevents the proper study of its aberrations under the disturbing influence of fracture or dislocation.

A much better method of displaying the bony trunk and its upper members in their true light, would be attained by resorting to a ball and socket mechanism, or rather to an India-rubber chondroid arrangement, which should be made to hold the blade-bone by its normal centre of motion to the corresponding surface over which it moved in life and health, at the proper distance from that surface as previously regulated by the intervening soft parts. This, with slightly elastic ligamentous bands for the clavicular joints, and with similar capsular and muscular connecting media for the humeral articulation, would be likely to do much more honor to the physiological realities of the parts concerned. It would enable us also to make some appreciative demonstration of the effect to be expected from oblique fractures of the clavicle in the course of its shaft, or from dislocation of either sternal or acromial end.

If the principle be correct, with due regard to the other accepted indications, of controlling the displacement in fractured clavicle by operating upon the diagonally opposite angles of the scapula, it does not appear very difficult to contrive a form of apparatus which may not only materially aid the treatment on the back, but enable many patients to do very well without this always unwelcome and uncertain, because unrespected, expedient. Our idea of the simplest form of extemporaneous apparatus, deserving such a title, may be gathered from the suggestions incidentally given in different parts of this paper, and especially in allusion to the back-splint of Brefield. We are not aware of the precise form or mode of application of Brefield's splint, but would venture to propose what might be regarded as, in some degree, a modification of that class of instruments, in which the arm or shoulder-straps are discarded, and the padded back-splint is applied, and combined with a padded body-bandage below the level of the shoulders, so as to press upon the lower blades of the scapulæ. This back-

splint, in order to be most efficient, should reach two or three inches beyond each side of the chest, and might be notched or mortised transversely at the two extremities, so as to facilitate the use of straps or body-bandages; or it might have a well-padded fellow, to be applied in a corresponding manner across the front of the chest, the two to be keyed together, at their ends, with a little Spanish windlass or garotte fastening, or any other that might be most convenient. The upper margins of the splints would have to be just above the line of the two axillæ in a well-formed person; but the two upper corners should be cut off and hollowed out, so as to avoid pressure on the arm-pits. A somewhat wedge-shaped flannel, or otherwise well-constructed, pad should be fastened, with the thin edge upwards, to the inner surface of the back-splint; at the same time that its projecting ends should be carefully guarded.

The fracture can be reduced and the splint applied most successfully while the patient is recumbent; in which position, also, it is easier to dispose of his arm and forearm. The endeavor should be to press the splint upon the shoulder-blade, so as to force the whole of this bone upwards and outwards; and to tilt the acromion backwards and outwards, by pressing the antagonizing angle and adjacent half of the lower plate,—or two-fifths of the whole bone,—in the opposite direction, or towards the ribs. The splint may be held up by a pair of suspenders reversed in application; so as to have the cross in front, and thus afford the proper suspension over the scapulæ behind, and avoid crossing over or outside of the seat of fracture. A bandage may of course be substituted for the suspenders, if employed with similar precautions; but neither these nor the body-belts ought to be of elastic or extensible materials. Linen or girthing, therefore, is preferable to cotton or caoutchouc, as more trustworthy because more unyielding. We have already hinted that the back-splint might be rendered still more useful by the addition, at the ends, of strong iron or steel wires, or with extemporanous heat-curved bits of iron

or hickory-hoop. These side-pieces should be bent into such a form of sigmoid curvature, as, when fixed in staples or otherwise at the extremities of the splint, and well-wrapped, and furnished with proper pads, they should pass through the arm-pit, to press upwards and backwards, if not, also, outwards, against the acromial articulation in front of the shoulder.

The greatest difficulty may be found in reconciling the integuments of the shoulder to the action of the pad, especially in recent stages of the injury, and in case of much contusion or unusual impatience of the individual patient, or irritability of his skin. These embarrassments are to be met by more careful padding and the other usual expedients; but extension by adhesive strips to the extended arm, with a weight over a pulley or a chair-back, as already suggested, might be advantageously adopted in many cases during the first few days, to aid the back-splint as well as to supplement or substitute the shoulder-compress. As, in this case, the position of the forearm is unimportant in its influence upon the shoulder, the easiest position for the former would be the best; and hence it should be allowed to be kept free, to be changed from pronation to supination while flexed at ease on a separate inclined plane pillow; or it might be rested upon the occiput under the head, on the parietal protuberance or side of the head, on the chest below the pectoral muscle, on the waist, or even on the hip (crest of the ilium), "akimbo," as Ambrose Paré recommends in his chapter on the subject of fractured clavicle (vol. ii, chap. viii, book xiii, p. 309, Malgaigne's Ed.).

We have thought of, and partially tested, some other contrivances; such as a sigmoid-shaped, narrow band or hoop of iron or steel, so arranged with a pot-hook curve at its upper extremity as to grasp the top of the shoulder, or rather to curve over and press only on the front; while the lower or middle portion was made to act upon a compress strapped upon the proper scapular space. The lower extremity would then have to be confined with bandages round the body and reaching to the perineum. The toe of

a slipper, or a similar shoulder-cap, might be used instead of the crochet or pot-hook, to act upon the shoulder; but both of these instruments would be uncertain and generally difficult to retain in place.

The only application in front of the clavicle, known to us, with the exception of the often-described compresses and small lateral splints and rollers about the seat of fracture,—which are generally abandoned as too apt to be worse than useless,—is the one referred to by the ingenious old British Surgeon, Wiseman, in his interesting memoirs (chap. iv, book vii). It was a splint of tin applied across the chest in front of the clavicles, extending from shoulder to shoulder; and was intended, in the particular case, to remedy the displacement owing to a sternal dislocation of the clavicle. He calls it a "tin-plate," "in the form of a clavicle, and to reach from one shoulder to the other, cut at the ends, to receive the fore-part of the shoulders and keep them out." This "plate" was placed over a compress on the joint, and was "rowled on close," where "it sat easy, and served to keep out his shoulders, also retained the bone in its place, whereby he was happily cured with mere dressing" (p. 280, vol. ii, 5th ed., 1719). It might, perhaps, answer a good purpose if furnished with an upright in the centre, like the cross of Heister; then made long enough to extend beyond the shoulders on each side, and provided at each end with adhesive bands, to be attached to the arms, by which a sufficient amount of moderate extension and counter-extension might be maintained upon the overlapping fragments. Turner, who is another of the eminently practical old English worthies in surgery, already cited, also describes "ferulas of tin shaped to the figure of the bone, and being first quilted, laid over the same; others, also, of pasteboard; some of wood" (p. 261). He decidedly objects to them as useless in his experience. They are interesting as waymarks, and especially as containing the germ of the yoke, and some other expedients of more recent times.

Whether the arm of the injured side be subjected to extension or not, it should be fastened on a right-angled or an acute-

angled splint, to keep it quiet in that position, with the forearm resting at ease on a separate pillow, or on the head, chest, side, or hip, and thereto confined. But if the extended position be found to be irksome or inconvenient, the whole limb must be confined with a handkerchief in the position of Velpeau. This position will be generally preferred by the patient as the most convenient, unless, as already suggested, the forearm be left at liberty. We have recently seen a man, now in the Hospital, who had an oblique fracture of each clavicle outside of the middle third, produced by a heavy fall of earth upon his head and shoulders. Dupuytren's position had an excellent effect upon the fragments, and increased the comfort of the patient for a while, as he was sensible of a better apposition of the fractured surfaces; but he soon became fatigued with the unaided effort to keep both arms in the extended and semiflexed position during several hours; and was allowed to change them to position on the chest.

As it is desirable, in some cases of unusually movable inner fragments or of retarded union, to confine both sides, the double Velpeau position, with crossed arms, may be resorted to, and very easily maintained, along with the back-splint and upright acromion compressors. Even the head might be readily retained in a slightly flexed position, with a cap and bands, or similar dressing; but this must be very rarely worth the trouble and annoyance. Still it is very certain that when the head is thrown back so as to put the sterno-cleido-mastoid on the stretch, the inner fragment moves with the averted head if there be any decided development of the clavicular fibres of that muscle, and the seat of fracture be not too near either of the articulations of the bone. This observation can be made with almost any recent case among the male adults in a surgical ward; it has been made also on the dead subject by sawing through the middle of the clavicle, and then moving the head.

The cartilaginous condition of the apophyses of the scapula and clavicle until the fifteenth year, although it disappears earlier in these precocious and spongy bones

than in other parts of the body, does not appear to make any practical difference in the treatment, fractures in these bones being often more amenable, and requiring proportionately less local pressure and confinement, and for a much shorter period, than in older patients. Displacement is often very great in children, and yet is well known to be scarcely perceptible at first in many instances, and not infrequently to escape discovery altogether, unless some subsequent violence, arising under neglect, shall have aggravated the deformity or completed the solution of continuity. We have always found, in these doubtful cases, careful pressure with the finger along the line of the clavicle an unerring test. The child invariably winces or cries out, generally both, the moment you touch the seat of injury. This, again, accords with the experience given long ago by Turner in his "Art of Surgery," previously quoted. He speaks (p. 259) of "semifracture" of the clavicle in children, and describes the effect of the finger exploration, in terms very similar to our own, written and repeatedly expressed, before having read his caveat on the subject. We have more than once detected in this way a fracture which had eluded others, and where the shoulder, which is the usually suspected seat of injury, was supposed to be the sprained or fractured part. In all these cases we would take the usual precautions, especially directing the child to be confined to bed for at least a week. This, indeed, is a rule which we have long been in the habit of enforcing in every case of fractured clavicle, when not actually impracticable, as, for many reasons, the most prudent course.

Before closing this very long, and, we fear, tedious paper, we desire to describe briefly an instrument which we last year had constructed by Mr. D. F. Kolbe, whose ingenuity and great experience in surgical and orthopedic mechanism were of material service in its invention. This compressor, truss-like in character, is composed of pads and a quarter-inch iron wire or narrow band, the wire or band being bent into a curved shape, somewhat like that of a pair of bullock's horns. The wire or band is armed with two large and thick com-

presses, which slide upon it from each end to near the large curve of each side, and are attached to screws, by which they are fastened down upon the scapulæ so as to cover the proper spaces. Two other smaller but well-padded compresses are similarly fixed upon the ends of the holder—one to each tip of the horns—and facing backwards and slightly upwards and outwards, so as to antagonize the other two which are placed upon the chest behind. From this description it will be understood that the bullock's horn truss-compressor is applied across the back, with its tips passing up to wind through the arm-pits to the front of each shoulder. All the pads are adjusted, and so screwed upon their objective surfaces behind and before, as to produce the best attainable result in accordance with the requirements of the case. We are unable to speak from experience of this apparently complex, but easily made and inexpensive, instrument. Either this, or something like it, ought to prove successful, if carefully made, manipulated, and persevered with. We tested the wire for one side only, that is a single bullock's horn—with its movable screw compresses—and found that it could be made to exert a complete control of the scapula, and hence of the fractured ends; but it required a ring on the sound shoulder, and extensive, but not uncomfortable, bandaging to keep the free extremity in proper place. The double arrangement, therefore, strikes us as more convenient and effective, or at least, available. As a matter of course, the amount of pressure to be employed, and the precautions to be observed in preventing excoriation or injurious action on the skin, must depend upon the kinds of compress used and upon the needs of each particular case.

The reader now has a choice of expedients and plans, some of which his ingenuity and industry will, we would fain hope, succeed in so employing and adapting as to accomplish the desired result. Our object will be gained if either of these, or any others, shall enable our professional brethren to practise with advantage on the principle which we have been led to believe the only true one,—that of

fixing the scapula by graduated pressure on its inferior blade and angle, and by supplementing this pressure on the lower portion of the scapula with counter-pressure on its diagonally opposite acromion.

We may as well observe, in conclusion, that dislocations of the clavicle, especially the acromial, which are so annoying in their treatment, are no less manageable by the supine position, and the different adjuvants which have been here discussed, than fractures of the clavicle, for reasons which need not be repeated, since they are identical in most respects with those which have been already given at so much length. We cannot speak from experience, but should be disposed to rely more upon a several weeks' confinement to bed, in these cases, with Dupuytren's position of the arm and forearm, combined or not with weight-extension, according to circumstances, than upon any form of apparatus hitherto employed. In accordance with this opinion, the best kind of a dressing for a dislocated clavicle, in those who were unwilling to remain upon their backs, would be the padded back-board, or the doubly curved wire with screw compressors, as already described in this paper.

In regard to the effect on the respiration of this mode of dealing with these injuries of the clavicle, we can not do better than to quote from the Bridgewater Treatise of Sir C. Bell (p. 52): "We would do well to remember this double office of the scapula and its muscles, that whilst it is the very foundation of the bones of the upper extremity, and never wanting in any animal that has the most remote resemblance to an arm, it is the centre and *point d'appui* of the muscles of respiration, and acts in that capacity when there are no extremities at all." Nothing, then, can aid the scapula in this important function, and at the same time relieve the broken clavicle, so much as keeping the whole extremity at rest by fixing its foundation.